

Properties of Quadrilaterals - Review

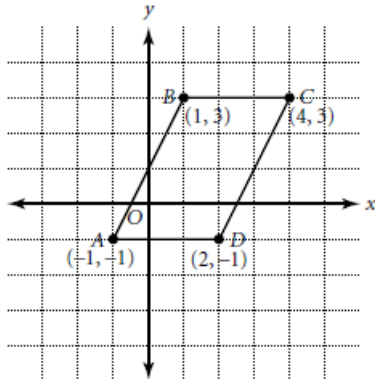
- Name the type of the quadrilaterals formed by the following points, and then give reasons for your answer.
 - $(-1,-2)(1,0),(-1,2),(-3,0)$
 - $(4,5),(7,6),(4,3),(1,2)$
- If $(1,2),(4,y),(x,6)$ and $(3,5)$ are vertices of the parallelogram taken in order, find the values of x and y . Give reasons for your answer.
- Given that $A(4, 3)$, $B(8, 3)$, $C(9, 10)$, and $D(5, 10)$ are vertices of a quadrilateral. Is quadrilateral $ABCD$ a parallelogram? Use mathematics to justify your answer. (Graphing can be used BUT IS NOT acceptable as a justification).
- If $A(2, 1)$, $B(5, 4)$, $C(8, 12)$, and $D(5, 9)$ are the vertices of a parallelogram, show that the diagonals bisect each other.
- You are working with the triangle whose vertices are $(-5,-1),(3,-5),(5,2)$. Determine the:
 - Length of each of the sides
 - Is the triangle a right triangle. How do you know?
- A quadrilateral with two pairs of parallel sides and four congruent sides is a _____.
 - Square
 - Trapezoid
 - Rectangle
 - Rhombus
 - None of the above
- Which of the following is not true?
 - The diagonals of a rhombus are congruent.
 - The diagonals of a rectangle are congruent.
 - The four sides of a rhombus are congruent.
 - A rectangle has 4 right angles.
 - A rhombus is a parallelogram.
 - The diagonals of a rhombus are perpendicular.
- A _____ is a quadrilateral having two pairs of parallel sides.
 - Parallelogram
 - Trapezoid
 - Polygon
 - Pentagon
 - None of the above
- In $\square JLKB$ the sum of the measures of angle J and angle K is 218° . If $J = (x + 148)^\circ$, what is the value of x ?
- In parallelogram $\square ERBO$, a diagonal RO is drawn. The measure of $\angle RBO = 86^\circ$ and the measure of $\angle ROB = 76^\circ$. What is the measure of $\angle ROE$?
- The perimeter of $\square HILG$ is 195 more than the length of side HI and 165 more than the length of side IL . What is the length of side LG ?
- Find the slope and length and midpoint of the following line segments:
 - AB given $A(3, 4)$ and $B(5, 8)$
 - CD given $C(2, 1)$ and $D(-4, 4)$
 - EF given $E(2, 3)$ and $F(2, 8)$

1. Plot the points $A(-1, -1)$, $B(1, 3)$, $C(4, 3)$, $D(2, -1)$ on the grid at right. Connect them to form quadrilateral $ABCD$.

What kind of quadrilateral is $ABCD$? Justify your answer.

2. Plot points $E(-1, -2)$, $F(-2, 1)$, $G(4, 3)$, and $H(5, 0)$. Identify quadrilateral $EFGH$ and justify your answer.

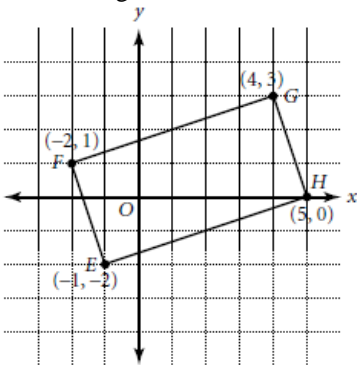
1. parallelogram



This is a **parallelogram** since **opposite sides are parallel**. I know opposite sides are parallel because I checked the slopes of each side. Both \overline{BC} and \overline{AD} have a slope of zero since they are horizontal. Both \overline{AB} and \overline{DC} have a slope of 2. Since the slopes of opposite sides are equal, the opposite sides are parallel.

	Slope
\overline{BC}	0
\overline{AB}	2
\overline{AD}	0
\overline{DC}	2

2. Rectangle



This is a **rectangle** since **opposite sides are parallel and adjacent sides are perpendicular**. I know this because I checked the slopes of each side.

Both \overline{EF} and \overline{GH} have a slope of -3 so they are parallel. Both \overline{FG} and \overline{HE} have a slope of $\frac{1}{3}$ so they are also parallel. Also -3 and $\frac{1}{3}$ are negative

	Slope
\overline{EF}	-3
\overline{FG}	$\frac{1}{3}$
\overline{GH}	-3
\overline{HE}	$\frac{1}{3}$

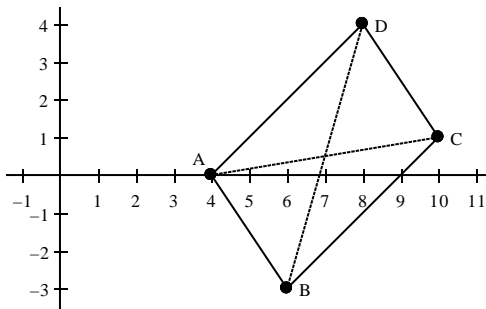
reciprocals. Each pair of adjacent sides has slopes that are negative reciprocals so they are perpendicular.

3-8 ANALYZING POLYGONS WITH COORDINATES

Given four vertices of a quadrilateral, determine and verify what type of quadrilateral it is. Use the table below as a guide.

		To show a quadrilateral is a _____,			
		Parallelogram	Rectangle	Rhombus	Square
show that	Sides	opposite pairs of sides are parallel (slope)	adjacent sides are perpendicular (slope)	all sides are congruent (distance)	adjacent sides are perpendicular (slope) & all sides are congruent (distance)
	Diagonals	bisect each other (midpoint)	are congruent (distance)	are perpendicular (slope)	are congruent (distance) & are perpendicular (slope)

Example: A(4,0) B(6,-3) C(10,1) D(8,4)



It appears to be a parallelogram,
not a rectangle or rhombus.

Useful formulas:
Slope: $m = \frac{y_2 - y_1}{x_2 - x_1}$
Midpoint: $M = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$
Distance: $D = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

To show the quadrilateral is a parallelogram, check slopes OR midpoints.

Option A: Slope of sides	Option B: Midpoint of diagonals
$m_{AB} = \frac{-3-0}{6-4} = \frac{-3}{2} = -\frac{3}{2}$ $m_{CD} = \frac{4-1}{8-10} = \frac{3}{-2} = -\frac{3}{2}$ $m_{BC} = \frac{1-(-3)}{10-6} = \frac{4}{4} = 1$ $m_{DA} = \frac{4-0}{8-4} = \frac{4}{4} = 1$ <p>Since the opposite sides of the quadrilateral have equal slopes, the sides are parallel. This means the quadrilateral is a parallelogram.</p>	$M_{AC} = \left(\frac{4+10}{2}, \frac{0+1}{2} \right) = \left(\frac{14}{2}, \frac{1}{2} \right) = (7, \frac{1}{2})$ $M_{BD} = \left(\frac{6+8}{2}, \frac{-3+4}{2} \right) = \left(\frac{14}{2}, \frac{1}{2} \right) = (7, \frac{1}{2})$ <p>Since the diagonals have the same midpoint, the diagonals bisect each other. This means the quadrilateral is a parallelogram.</p>

To show the quadrilateral isn't a rectangle, check slopes OR distance.

Option A: Slope of sides	Option B: Length of diagonals
$m_{AB} = \frac{-3-0}{6-4} = \frac{-3}{2} = -\frac{3}{2}$ $m_{BC} = \frac{1-(-3)}{10-6} = \frac{4}{4} = 1$ $m_{CD} = \frac{4-1}{8-10} = \frac{3}{-2} = -\frac{3}{2}$ $m_{DA} = \frac{4-0}{8-4} = \frac{4}{4} = 1$ <p>The slopes of the adjacent sides are not opposite reciprocals, so the sides are not perpendicular, meaning the quadrilateral is not a rectangle.</p>	$AC = \sqrt{(10-4)^2 + (1-0)^2} = \sqrt{6^2 + 1^2} = \sqrt{36+1} = \sqrt{37}$ $BD = \sqrt{(8-6)^2 + (4-(-3))^2} = \sqrt{2^2 + 7^2} = \sqrt{4+49} = \sqrt{53}$ <p>The diagonals have different lengths, so they're not congruent, meaning the quadrilateral is not a rectangle.</p>

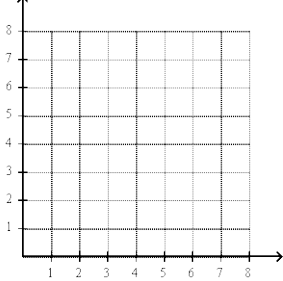
Note: On homework, only show that the figure is a parallelogram (showing it's not a rectangle isn't necessary). Also, choose one option

Homework

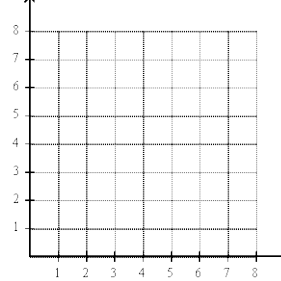
For each set of vertices,

- Graph the quadrilateral
- Make a conjecture about the type of quadrilateral
- Verify your conjecture according to the table above (only check one option)
- Write a sentence summarizing your findings

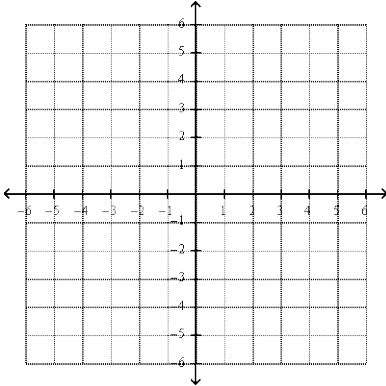
1. A(0,1) B(2,0) C(4,4) D(2,5)



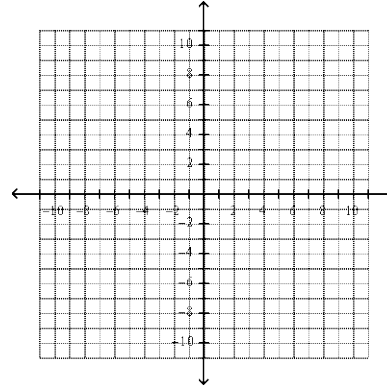
2. E(2,3) F(7,3) G(5,0) H(0,0)



3. J(2,-3) K(-3,1) L(1,6) M(6,2)



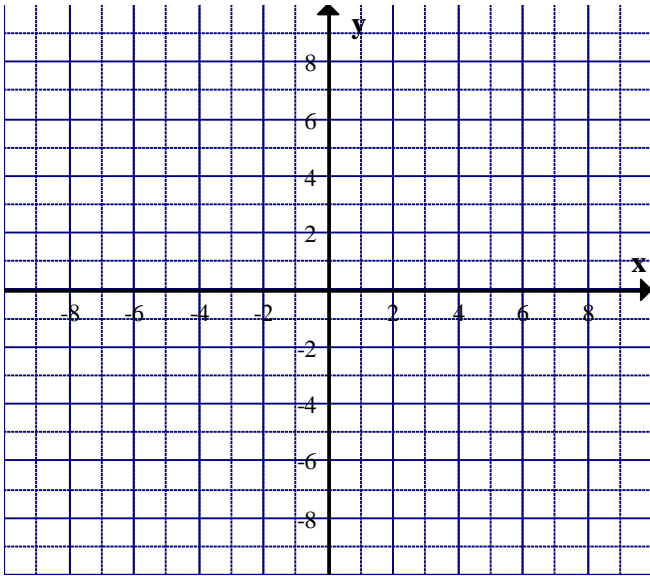
4. R(-1,8) S(-6,-2) T(5,0) U(10,10)



Section A: Midpoints

For problems 1 – 3, complete parts a and b.

- a) Graph the following segments on the grid provided below.



- b) Find the midpoint of each segment using the midpoint formula. Graph the midpoint on the segments at left.

1. $C = (4, 3)$ and $T = (-3, -4)$

Midpoint: $A = (___ , ___)$

2. $D = (5, 8)$ and $G = (-7, 6)$

Midpoint: $O = (___ , ___)$

3. $L = (-3, -8)$ and $v = (-5, -4)$

Midpoint: $U = (___ , ___)$

Section B: Parallel and Perpendicular Segments

The endpoints of two segments are given. Use slope to determine whether the segments are parallel, perpendicular or neither.

4. $(-2, 1)$ and $(3, 7)$;
 $(1, 1)$ and $(-3, 11)$

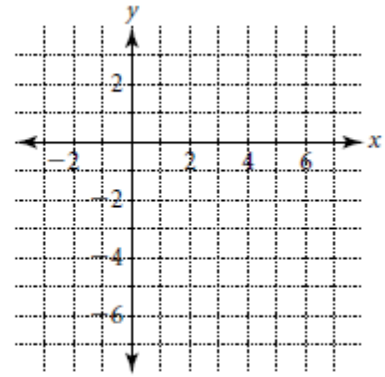
5. $(2, -1)$ and $(6, 11)$;
 $(-3, -7)$ and $(-1, -1)$

6. $(-4, 0)$ and $(2, 3)$;
 $(-2, 1)$ and $(4, -11)$

Coordinate Geometry – Identifying Quadrilaterals

7. On the grid provided, graph quadrilateral $ABCD$.
What type of quadrilateral is this? Justify your answer.

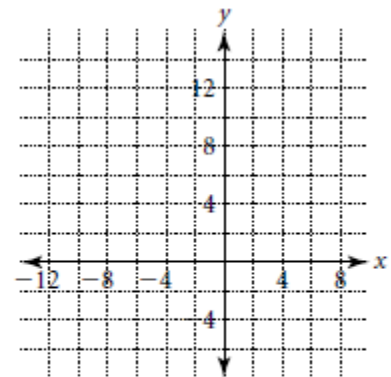
$A(3, 2), B(1, -2), C(2, -5), D(4, -1)$



8. The endpoints of two segments are given. Draw each segment on the grid provided, then connect the endpoints to each other. What type of quadrilateral do you think this is? Explain your answer.

\overline{AC} has endpoints $(-3, 11)$ and $(2, -4)$.

\overline{BD} has endpoints $(-6, 5)$ and $(3, 8)$.



(Hint for #8: use the diagonals)

Section D: Pythagorean Theorem

Find the missing side lengths:

9. $a = 3, b = 7, c = ?$

10. $a = 2, b = ?, c = 8$

11. $a = ?, b = 9, c = 15$

12. $a = 6, b = ?, c = 12$

